

**PCT**WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau

## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : <b>A01N 25/24, 53/00</b>		<b>A1</b>	(11) International Publication Number: <b>WO 00/03593</b> (43) International Publication Date: <b>27 January 2000 (27.01.00)</b>
(21) International Application Number: <b>PCT/IB99/01405</b>		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GD, GE, GH, GM, HR, HU, ID, IL, JN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).	
(22) International Filing Date: <b>14 July 1999 (14.07.99)</b>			
(30) Priority Data: 60/093,221 17 July 1998 (17.07.98) US 09/228,737 12 January 1999 (12.01.99) US			
(71) Applicant: MAGISEAL CORPORATION [CA/CA]; 1065 Clarke Road, London, Ontario N5V 3B3 (CA).			
(72) Inventors: HARRIS, James, T.; 320 St. George Street, London, Ontario N6A 3B1 (CA). TANGELDER, Bernardus, M.; 180 Ardsley Crescent, London, Ontario N6G 3W7 (CA).			
<b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>			
(54) Title: FABRIC, CARPET AND UPHOLSTERY PROTECTANT WITH BIOCIDE AND ACARICIDE			
(57) Abstract <p>A composition for treating a substrate to control dust mite populations thereon. The composition includes a fluoropolymer, a biocide, and an acaricide.</p>			

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

1 FABRIC, CARPET AND UPHOLSTERY PROTECTANT  
2 WITH BIOCIDE AND ACARICIDE

3  
4 CROSS-REFERENCE TO RELATED APPLICATION

5 This application claims the benefits of U.S.  
6 Provisional Application No. 60/093,221, filed July 17,  
7 1998.

8

9 BACKGROUND OF THE INVENTION

10 This invention relates to compositions for treating  
11 substrates, and in particular to compositions for treating  
12 substrates to control dust mites.

13

14 Allergies to dust are common in the U.S. and Western  
15 European countries. Many of these allergies are caused by  
16 allergens produced by acarids present in dust, such as  
17 *Dermatophagoides farinae*, *Euroglyphus maynei*, and  
18 *Dermatophagoides pteronyssinus*. Such acarids are commonly  
19 referred to as "dust mites". Two types of allergens are  
20 produced by dust mites: Group I allergens, which are  
21 released by dust mites via fecal pellets, and Group II  
22 allergens which are present in the bodies of the dust  
23 mites. It has been determined that the threshold level for  
24 dust mite allergen sensitization is about 100-500  
25 mites/gram.

26 It is known that dust mites derive their nourishment  
27 from the dead skin, nail debris, fur, and feathers of  
28 humans and animals (often collectively referred to as  
29 "squamae"). Mold provides dust mites with vitamins, which  
30 helps the dust mites digest squamae. Thus, dust mites live  
31 in areas where abundant amounts of squamae can be found,  
32 where the temperature is warm, where the humidity is  
33 relatively high, and where there is little light (because  
34 dust mites are sensitive to solar UV). Consequently, dust  
35 mites thrive in substrates that have prolonged contact with  
36 humans, e.g., bedding, upholstered furniture, and carpets.

1           Acaricidal compositions have been developed to treat  
2 substrates. Typically, acaricidal compositions include an  
3 acaricide and a carrier, such as water or an organic  
4 solvent. These acaricidal compositions poison dust mites,  
5 but do not reduce environmental conditions that are  
6 favorable to dust mites, such as high humidity and abundant  
7 food supplies.

Based upon the foregoing, there is a need in the art for a composition for treating substrates to control dust mites, wherein the composition reduces environmental conditions favorable to dust mites. The present invention is directed to such a composition.

## SUMMARY OF THE INVENTION

15 It therefore would be desirable, and is an advantage  
16 of the present invention, to provide a composition for  
17 treating substrates to control dust mites, wherein the  
18 composition reduces environmental conditions favorable to  
19 dust mites. In accordance with the present invention, the  
20 composition includes a fluoropolymer, a biocidally  
21 effective amount of a biocide, and an acaricidally  
22 effective amount of an acaricide. Also provided in  
23 accordance with the present invention are methods of  
24 treating substrates to control dust mites. The methods  
25 include the step of applying a composition to the  
26 substrate. In one embodiment, the composition includes a  
27 fluoropolymer and an acaricidally effective amount of an  
28 acaricide. In another embodiment, the composition includes  
29 a biocidally effective amount of a biocide, and an  
30 acaricidally effective amount of an acaricide.

32 DETAILED DESCRIPTION OF  
33 THE PREFERRED EMBODIMENTS OF THE INVENTION

It should be noted that parts are parts by weight and percents are weight percents unless otherwise indicated or apparent. In addition, when a preferred range such as 5-25

1       is given, this means preferably at least 5 and preferably  
2       not more than 25.

3       As used herein, the term "acaricide" shall mean a  
4       material that kills or materially inhibits the growth,  
5       reproduction, or spread of acarids, including but not  
6       limited to dust mites. An "acaricidally effective amount"  
7       of an acaricide is that amount that will kill or materially  
8       inhibit the growth, reproduction or spread of a significant  
9       number of acarids.

10      As used herein, the term "biocide" shall mean a  
11      material that kills or materially inhibits the growth,  
12      division, reproduction, or spread of microorganisms, such  
13      as bacteria, algae, and fungi. A "biocidally effective  
14      amount" of a biocide is that amount that will kill or  
15      materially inhibit the growth, division, reproduction, or  
16      spread of a significant number of microorganisms.

17      As used herein, the term "fluoropolymer" shall mean  
18      any polymer, copolymer, or mixture of polymers, wherein  
19      some or all of the hydrogens are replaced with fluorine.

20      As used herein, the term "powderizing agent" shall  
21      mean a material that operates as an inert carrier to render  
22      a liquid into a solid.

23      Preferably, the composition of the present invention  
24      is in liquid form and is organic solvent-based. Less  
25      preferably, the composition is in liquid form and is water-  
26      based. Still less preferably, the composition is in powder  
27      form.

28      The preferred formulation (Formulation 1) for the  
29      organic solvent-based embodiment of the composition is as  
30      follows:

31	32	33	<u>Weight Percent</u>		
			Component	Preferred	Less Preferred
34	35	36	1. Polymer A	7.55	5 - 15 .1 - 20
37	38	39	2. Biocide	.25	.05 - 1 .001 - 5
40			3. Acaricide	.1	.05 - 3 .01 - 10

1        4. Solvent A              92.1        81 - 94.9        65 - 99.88  
 2

3                  The preferred formulation (Formulation 2) for the  
 4                  water-based embodiment of the composition is as follows:  
 5

		<u>Weight Percent</u>		
	Component	Preferred	Less Preferred	Less Preferred
10	1. Polymer B	2.9	2-15	.1 - 20
11	2. Biocide	.25	.05 - 1	.0001 - 5
12	3. Acaricide	.1	.05 - 3	.01 - 10
13	4. Surfactant A	1.3	.5 - 5	.1 - 10
14	5. Glycol ether A	2.5	.5 - 5	.1 - 10
15	6. Glycol ether B	2.5	.5 - 5	.1 - 10
16	7. Water	90.45	66 - 96.4	35 - 99.5899

25                  The preferred formulation (Formulation 3) for the  
 26                  powder embodiment of the composition is as follows:  
 27

		<u>Weight Percent</u>		
	Component	Preferred	Less Preferred	Less Preferred
32	1. Polymer A	7.55	5 - 15	.1 - 20
33	2. Biocide	.25	.05 - 1	.01 - 2
34	3. Acaricide	.1	.05 - 3	.01 - 10
35	4. Powderizing Agent	92.1	81 - 94.9	69 - 99.88

41                  Preferably, polymers A and B prevent water and other  
 42                  polar and non-polar liquids and soils from penetrating the  
 43                  substrate to which the composition of the present invention  
 44                  is applied, and also prevent the biocides A and B and the  
 45                  acaricide from being removed from the substrate by water  
 46                  and other liquids. The polymers A and B preferably reduce  
 47                  the surface energy of the substrate to 16-30 dynes/cm.

1        This low surface energy prevents water and most oils from  
2        wetting or spreading over or into the substrate. It is  
3        believed that the low surface energy also helps prevent  
4        soil, such as squamae, from adhering to the substrate.  
5        Thus, the polymers A and B preferably keep the substrate  
6        clean and dry, thereby making the substrate less suitable  
7        for hosting dust mites.

8        Preferably, polymer A is a perfluorinated polymer sold  
9        under the name Bartex AF NF by TriTex. Polymer B is  
10      preferably a perfluoroalkyl methacrylic copolymer sold  
11      under the name Zonyl 8740 by E.I. Du Pont de Nemours. Less  
12      preferably, polymers A and B are fluorinated or  
13      perfluorinated acrylics, methacrylics, styrenes, or  
14      polyethylenes, or other type of fluoropolymers. Still less  
15      preferably, polymers A and B are silicone polymers, such as  
16      polymethylhydrosiloxane. Still less preferably, polymers A  
17      and B are any other polymer, copolymer, or mixture of  
18      polymers that provides a water resistant coating.

19       Preferably, the biocide is active against a broad  
20      spectrum of organisms, including Gram negative and Gram  
21      positive bacteria, and fungi. It is also preferred if the  
22      biocide is not irritating to human skin, is not readily  
23      deactivated by soil load, and is compatible with water  
24      repellent polymers, such as fluoropolymers. The biocide  
25      preferably reduces and prevents the growth of mold, fungi,  
26      bacteria, and algae, which are potential food sources for  
27      dust mites.

28       The biocide is preferably didecyldimethylammonium  
29      chloride, which is a quaternary ammonium compound sold by  
30      Lonza UK Ltd. under the name Bardac 22. Less preferably,  
31      the biocide is another quaternary ammonium compound, such  
32      as: benzyl trimethyl ammonium chloride, which is sold by  
33      Rhodia under the name DMB 451; didecyldimethylammonium  
34      chloride, which is sold by the Stepan Company under the  
35      name BTC 1010; benzalkonium chloride, which is sold by  
36      Bayer AG under the name Zephiorol; benzethonium chloride,  
37      which is sold by Lonza under the name Hyamine 1622; a dual

1       quaternary ammonium compound, such as a mixture of  
2       myristalkonium chloride and quaternium 14, which is sold by  
3       the Stepan Company under the name BTC 2125; or 3-  
4       (trimethoxysilyl)-propyldimethyloctadecyl ammonium  
5       chloride. Less preferably the biocide is a mixture of a  
6       quaternary ammonium compound with a phenolic compound,  
7       wherein the weight ratio of the quaternary ammonium  
8       compound to the phenolic compound is from 1:1 to 3:1.  
9       Still less preferably, the biocide is a phenolic compound.  
10      Phenolic compounds that may be used include ortho-  
11      phenylphenol and its sodium salt, which are respectively  
12      sold by Dow Chemical under the names Dowicide 1 and  
13      Dowicide A; and pentachlorophenol, which is sold by Dow  
14      Chemical under the name Dowicide 7. Still less preferably,  
15      the biocide is an isothiazolin, such as 2-octyl-4-  
16      isothiazolin-3-one, which is sold by Rohm and Haas under  
17      the name Kathon 893; or 2-bromo-2-nitropropane-1, 3-diol,  
18      known as bronopol, and sold by the Angus Chemical Company  
19      and the Inolex Chemical Company. Still less preferably,  
20      the biocide is another known biocide.

21      Preferably, a biocidally effective amount of the  
22      biocide is used in the organic solvent-based composition of  
23      the present invention and in the powder-based composition  
24      of the present invention. Preferably, a biocidally  
25      effective amount of the biocide is also used in the water-  
26      based composition of the present invention.

27      Preferably, the acaricide significantly reduces,  
28      and/or prevents an increase in, the number of dust mites  
29      present in or on the substrate to which the composition of  
30      the present invention is applied. It is also preferred if  
31      the acaricide is not irritating to human skin, is  
32      compatible with water repellent polymers, such as  
33      fluoropolymers, and is effective for an extended period of  
34      time, e.g. three years or longer.

35      Preferably, the acaricide is 3-phenoxybenzyl (1 RS,  
36      3RS)-(1 RS, 3 SR)-3-(2,2-dichlorovinyl)-2,2-dimethyl-  
37      cyclopropanecarboxylate, CAS Registry Number 52645-53-1,

1       which is a synthetic pyrethroid known as permethrin and is  
2       sold by McLaughlin Gormley King Company. Less preferably,  
3       the acaricide is benzyl benzoate, or another pyrethroid,  
4       such as an allethrin, bioresmethrin, cypermethrin,  
5       cyhalothrin, deltamethrin, or natural pyrethrum. Still  
6       less preferably, the acaricide is another known acaricide.

7       Preferably, an acaricidally effective amount of the  
8       acaricide is used in the organic solvent-based composition  
9       of the present invention and in the powder-based  
10      composition of the present invention. Preferably, an  
11      acaricidally effective amount of the acaricide is used in  
12      the water-based composition of the present invention.

13      The solvent A functions as a carrier in the organic  
14      solvent-based composition of the present invention. The  
15      solvent A dissolves polymer A, the biocide, and the  
16      acaricide and carries them onto the substrate. Once the  
17      composition is deposited on the substrate, the solvent A  
18      quickly evaporates and leaves no residue behind.

19      Solvent A is preferably an isoparaffinic solvent sold  
20      by the Exxon Chemical Company under the name Isopar G.  
21      Less preferably, solvent A is an alkane, such as hexane, or  
22      heptane; kerosene; mineral spirits; an alkyl benzene, such  
23      as toluene, or xylene; an ester, such as ethyl acetate; a  
24      hydrofluorocarbon, such as 1-H-perfluorohexane; a  
25      fluorether; or another known aromatic, halogenated, or  
26      aliphatic solvent.

27      Water functions as a carrier in the water-based  
28      composition of the present invention. Surfactant A  
29      solubilizes the biocide and the acaricide into the water,  
30      while the glycol ether A and the glycol ether B help to  
31      solubilize the polymer B into the water. Once the  
32      composition is deposited on the substrate, the water  
33      evaporates, leaving the surfactant A on the substrate.  
34      Without being limited by theory, it is believed that the  
35      residual surfactant traps soil onto the substrate and  
36      reduces the efficacy of the polymer B. Accordingly, it is

1       important to minimize the amount of surfactant A used in  
2       the composition.

3       Preferably, the surfactant A is a surfactant  
4       comprising 2,6,8-trimethyl-4-nonal with ethylene oxide,  
5       which is sold by Union Carbide under the name Tergitol TMN-  
6       6. Less preferably, surfactant A is another alcohol  
7       alkoxylate, an alkyl phenol alkoxylate, a glucoside, a  
8       sorbitan, a block polymer, an amine oxide, an amphoteric  
9       surfactant, a quaternary ammonium composition, an anionic  
10      surfactant, or a polymeric surfactant. Still less  
11      preferably, surfactant A is another known surfactant.

12      Glycol ether A is preferably dipropylene glycol  
13      monomethyl ether, which is sold by Dow Chemical under the  
14      name Dowanol DPM. Glycol ether B is preferably dipropylene  
15      glycol monobutyl ether, which is sold by Dow Chemical under  
16      the name Dowanol DPnB. Less preferably, glycol ethers A  
17      and B are other glycol ethers. Still less preferably, the  
18      glycol ethers A and B may be replaced with alcohols.

19      The powderizing agent functions as a carrier in the  
20      powder-based composition of the present invention. The  
21      powderizing agent renders the polymer A, the biocide, and  
22      the acaricide into a solid. Preferably, the powderizing  
23      agent is talc, sodium sulfate, sodium carbonate, calcium  
24      carbonate, or other carbonate. Less preferably, the  
25      powderizing agent is another known powder carrier.

26      Polymer A, the biocide, the acaricide, and solvent A  
27      are blended together using customary and known methods to  
28      form the organic solvent-based composition of the present  
29      invention. Preferably, the temperature during blending is  
30      maintained at ambient temperature, i.e., @ 70°F.

31      Polymer B, the biocide, the acaricide, surfactant A,  
32      glycol ether A, glycol ether B, and the water are blended  
33      together using customary and known methods to form the  
34      water-based composition of the present invention.  
35      Preferably, the temperature during blending is maintained  
36      at ambient temperature, i.e., @ 70°F.

1           Polymer A, the biocide, the acaricide, and the  
2        powderizing agent are blended together using customary and  
3        known methods to form the powder-based composition of the  
4        present invention. Preferably, the temperature during  
5        blending is maintained at ambient temperature, i.e., @  
6        70°F.

7        Preferably, the organic solvent-based and water-based  
8        compositions of the present invention are applied to a  
9        substrate using a pump-type sprayer. Less preferably, an  
10      aerosol sprayer may be used, which is typically in the form  
11      of a steel can. Aerosol propellants, such as isobutane, or  
12      CO<sub>2</sub>, are used in the aerosol sprayer to dispense the organic  
13      solvent-based and water-based compositions. Known  
14      corrosion inhibitors may also be included to prevent  
15      corrosion of the steel can.

16      The powder-based composition of the present invention  
17      may be applied to a substrate from a bottle, box, can, or  
18      other container, which is preferably provided with a  
19      dispenser, such as a grate, or a plurality of apertures.  
20      The powder-based composition is applied by shaking,  
21      sprinkling, and/or rubbing the powder composition into the  
22      substrate.

23      The composition of the present invention may be used  
24      on any substrate upon which, or within which dust mites may  
25      be disposed, or through which dust mites may pass. Such  
26      substrates include, but are not limited to, textile fibers  
27      (or filaments), fabrics, clothing, carpets, rugs,  
28      upholstery, furniture, bedding, mattresses, pillows,  
29      curtains, and couches.

30      The composition of the present invention provides many  
31      advantages. When applied to a substrate, the composition  
32      kills dust mites that are already present on the substrate,  
33      as well as dust mites that later contact the substrate. In  
34      addition, the composition keeps the substrate clean and  
35      dry, and kills bacteria and fungi, thereby reducing food  
36      sources available to dust mites, which helps reduce the  
37      population of dust mites already present on the substrate

1 and discourages migration of dust mites to the substrate.  
2 In this manner, the composition is both reactive and  
3 preventative in terms of controlling dust mites.

4 The following Examples further illustrate various  
5 aspects of the invention. Unless otherwise indicated, the  
6 ingredients are combined using methods known in the art or  
7 as described above.

8

9 Example 1

10 A test was performed to measure the efficacy of the  
11 organic solvent-based and water-based compositions of the  
12 present invention in controlling *Dermatophagoides farinae*  
13 (commonly known as the "American house dust mite") on a  
14 carpet substrate.

15 An organic solvent-based composition was prepared in  
16 accordance with Formulation 1 by blending 7.55 parts of  
17 Bartex AF NF (perfluorinated polymer), 0.1 parts of  
18 Dowicide 1 (orthophenyl phenol), 0.1 parts of permethrin,  
19 and 92.25 parts of Isopar G (isoparaffinic solvent). The  
20 composition with the foregoing formulation shall be  
21 referred to in this Example 1 and in Examples 2 and 3 as  
22 the "Solvent Inventive Composition".

23 A water-based composition was prepared in accordance  
24 with Formulation 2 by blending 2.9 parts of Zonyl 8740  
25 (perfluoroalkyl methacrylic copolymer), 0.1 parts of  
26 Dowicide A (sodium-orthophenyl phenol), 0.1 parts of  
27 permethrin, 1.3 parts of Tergitol TMN-6 (2,6,8-trimethyl-4-  
28 nonanol with ethylene oxide), 2.5 parts Dowanol DPM  
29 (dipropylene glycol monomethyl ether), 2.5 parts Dowanol  
30 DPnB (dipropylene glycol monobutyl ether), and 90.6 parts  
31 water. The composition with the foregoing formulation  
32 shall be referred to in this Example 1 and in Examples 2  
33 and 3 as the "Aqueous Inventive Composition".

34 Three sections of carpet were selected. Each section  
35 of carpet was the same style and color, and had a size of  
36 about 23 inches by 46.5 inches. The sections of carpet  
37 were new and not treated with any stain blockers. Using

1 spray bottles, the Solvent Inventive Composition was  
2 applied to a first one of the sections, the Aqueous  
3 Inventive Composition was applied to a second one of the  
4 sections, and a control consisting of water was applied to  
5 a third one of the sections. The application rates for  
6 each of the compositions was about 20.97 ml per ft<sup>2</sup>.  
7 Following the application of the compositions to the  
8 sections, each of the sections was rubbed with a plastic  
9 sheet to assure proper coverage. The sections were then  
10 allowed to dry for a period of 24 hours.

11 After drying, the backing of each of the sections was  
12 marked with grid lines to make numbered squares that would  
13 fit into 15 x 60 mm petri dishes. Three squares from each  
14 of the sections were randomly selected using a random  
15 number generator. The carpet squares were then cut from  
16 the sections to provide a total of nine squares, three from  
17 each section. The three squares from each section  
18 constituted a "sample" of the composition applied to the  
19 section.

20 Each square was placed in a petri dish and inoculated  
21 with 40 adult American house dust mites. In each square,  
22 the mites were innoculated in the center of the square  
23 using a fine (000) brush. The petri dishes containing the  
24 squares were then covered with paraffin lids and placed in  
25 humidity chambers. The petri dishes containing the squares  
26 were maintained in the humidity chambers at a relative  
27 humidity of about 75% and at room temperature, i.e., about  
28 70-75°F, for 96 hours.

29 After the 96 hour period, the acute mortality of the  
30 American house dust mites in each sample was assessed using  
31 a "heat escape procedure", wherein the petri dishes were  
32 inverted (with paraffin lids facing down) and placed under  
33 a 100 watt light source, such that the heat (@ 108°F)  
34 generated by the light source would drive alive mites to  
35 the paraffin lids. The surfaces of the paraffin lids were  
36 then examined and the number of alive mites counted. This  
37 heat escape procedure was performed a total of three times

1       on each petri dish of the sample, with a new paraffin lid  
2       being used for each procedure. The squares in each petri  
3       dish were then microscopically examined for mites. Mites  
4       were scored as dead if they failed to move one body length  
5       in response to gentle brushing. Mortality values were then  
6       expressed as mean mortality for the three squares in the  
7       sample,  $\pm$  standard error margin (SEM).

8       A t-test of proportions was performed to compare  
9       mortality between the samples of the Solvent Inventive  
10      Composition, the Aqueous Inventive Composition, and the  
11      negative control. When the mortality of the house dust  
12      mites in the samples of the Solvent Inventive Composition,  
13      the Aqueous Inventive Composition, and the negative control  
14      were compared by the studentized t-test of proportions  
15      ( $P<0.05$ ), it was shown that the Solvent Inventive  
16      Composition and the Aqueous Inventive Composition provided  
17      significantly different results from the negative control  
18      and each other. The results of the test were as follows:

<u>Mortality, %</u>		
22      Solvent-Based		
23      Inventive Composition	100	$\pm$ 0.0
25      Water-Based	72.5	$\pm$ 5.2
26      Inventive Composition		
28      Negative Control	10.8	$\pm$ 0.8
29		
30		

31       As shown by the above results, the Solvent Inventive  
32      Composition and the Aqueous Inventive Composition both  
33      provide effective control of dust mites. The Solvent  
34      Inventive Composition provides especially good dust mite  
35      control, having killed all of the dust mites in the sample,  
36      which was a surprising and unexpected result.

37

#### Example 2

39       A water repellency test was performed to measure the  
40      efficacy of the organic solvent-based and water-based  
41      compositions of the present invention in repelling water.

1       The test was performed in accordance with a modified  
2       version of the American Association of Textile Chemists and  
3       Colorists (AATCC) Test Method 22-1989 Water Repellency;  
4       Spray Test. Water repellency is defined by the AATCC as  
5       the characteristic of a fibre, yarn, or fabric to resist  
6       wetting.

7       The Solvent Inventive Composition was applied to a  
8       piece of untreated cotton fabric, and the Aqueous Inventive  
9       Composition was applied to another piece of cotton fabric.  
10      Water was poured over the pieces of cotton fabric, and  
11      their repellency was then evaluated. No sticking or  
12      wetting of the upper surfaces of the pieces of cotton  
13      fabric was observed.

14      As shown by the above results, the application of the  
15      Solvent Inventive Composition and the Aqueous Inventive  
16      Composition to substrates renders the substrates water  
17      repellant.

18

19      Example 3

20      An oil repellency test was performed to measure the  
21      efficacy of the organic solvent-based and water-based  
22      compositions of the present invention in repelling oil.  
23      The test was performed in accordance with AATCC Test Method  
24      118-1992 Oil Repellency; Hydrocarbon Test. The test  
25      utilizes standard test liquids consisting of a series of  
26      hydrocarbons with varying surface tensions.

27      The Solvent Inventive Composition was applied to a  
28      piece of cotton fabric, and the Aqueous Inventive  
29      Composition was applied to another piece of cotton fabric.  
30      Drops of the test liquids were applied to each piece of  
31      cotton fabric. After each drop of test liquid was applied  
32      to a piece of cotton fabric, the piece of cotton fabric was  
33      observed for wetting, wicking, and contact angle. The  
34      piece of cotton fabric was then given a grade number, which  
35      was the highest number test liquid that did not wet the  
36      piece of cotton fabric. Grade 0 is the lowest oil  
37      repellency, while grade 8 is the highest oil repellency.

1           The piece of cotton fabric to which the Solvent  
2       Inventive Composition was applied was given a grade number  
3       of 6, while the piece of cotton fabric to which the Aqueous  
4       Inventive Composition was applied was given a grade number  
5       of 2. Grade 6 corresponds to n-decane, while grade 2  
6       corresponds to a mixture of 65 volume percent of liquid  
7       paraffin and 35 volume percent of n-hexadecane.

8           As shown by the above results, the application of the  
9       Solvent Inventive Composition to a substrate will cause the  
10      substrate to repel most oils. The application of the  
11      Aqueous Inventive Composition to a substrate will cause the  
12      substrate to repel some oils.

13

14       Example 4.

15       A test was performed to measure the efficacy of the  
16      organic solvent-based composition of the present invention  
17      in controlling bacteria.

18       A plurality of organic solvent-based compositions,  
19      S1-S7, were prepared in accordance with Formulation 1 by  
20      blending 7.55 parts of Bartex AF NF (perfluorinated  
21      polymer), 0.1 parts of permethrin, 0.1 parts Dowicide 1  
22      (ortho-phenylphenol), and varying amounts of Bardac 22  
23      (didecyldimethylammonium chloride) and Isopar G  
24      (isoparaffinic solvent). The varying weight percents of  
25      Bardac 22 and Isopar G for the compositions were as  
26      follows:

27

28 <u>Composition</u>	29 <u>Bardac 22</u>	29 <u>Isopar G</u>
30       S1	31       0.0	32       92.25
31       S2	32       0.009	33       92.241
32       S3	33       0.019	34       92.231
33       S4	34       0.038	35       92.212
34       S5	35       0.075	36       92.175
35       S6	36       0.15	37       92.10
36       S7	37       0.3	38       91.95

37

38

39       A 0.5 m<sup>2</sup> sample of untreated, cotton-based upholstery  
40      fabric was cut into a plurality of 20mm X 20mm samples.  
41      Thirty-five samples were used in the test, a set of five

1 samples being used for each composition. Each set of  
2 samples was immersed in its respective composition for  
3 approximately 5 minutes. The sets of samples were then  
4 removed and allowed to drain on an inclined surface. The  
5 sets of samples were then transferred to sterile petri  
6 dishes and allowed to stand overnight in a fume extraction  
7 cabinet to dry thoroughly.

8 Three samples from each set were selected at random  
9 and placed onto the surface of a Malt Extract Agar plate.  
10 Thus, seven plates, with three samples in each plate were  
11 used, one plate being used for each composition. Each of  
12 the plates was then inoculated with an aliquot (100  $\mu$ l  
13 spread uniformly over both the plate and the samples) of a  
14 spore suspension of *Penicillium pinophyllum* (IMI 114933: ca  
15  $10^7$  spores per ml). The plates were then incubated at 24°C  
16 for 5 days. The plates were then inspected for growth,  
17 with the following results:

18	19	Comp.	Growth
20		S1	samples virtually overgrown
21		S2	samples partially overgrown
22		S3	some surface growth on samples
23		S4	surface growth restricted to edges of samples
24		S5	little surface growth, slight zone of inhibition
25		S6	no surface growth, moderate zone of inhibition
26		S7	no surface growth, significant zone of inhibition
27			
28			
29			

30 As shown by the above results, the organic solvent-  
31 based composition of the present invention has good  
32 biocidal properties, which helps reduce food sources  
33 available to dust mites.

34 While the invention has been shown and described with  
35 respect to particular compositions thereof, those  
36 compositions are for the purpose of illustration rather  
37 than limitation, and other variations and modifications of  
38 the specific compositions herein described will be apparent  
39 to those skilled in the art, all within the intended spirit  
40 and scope of the invention. Accordingly, the invention is  
41 not to be limited in scope and effect to the specific

1 compositions herein described, nor in any other way that is  
2 inconsistent with the extent to which the progress in the  
3 art has been advanced by the invention.

WHAT IS CLAIMED IS:

1        1. A composition for treating a substrate to control  
2        dust mites, said composition comprising a fluoropolymer, a  
3        biocidally effective amount of a biocide, and an  
4        acaricidally effective amount of an acaricide.

1        2. The composition of claim 1, wherein the acaricide  
2        is a pyrethroid.

1        3. The composition of claim 2, wherein the acaricide  
2        is permethrin; and  
3              wherein the biocide is didecyldimethylammonium  
4        chloride.

1        4. The composition of claim 3, wherein the  
2        fluoropolymer is perfluorinated.

1        5. The composition of claim 1, further comprising an  
2        organic solvent.

1        6. The composition of claim 1, wherein the biocide is  
2        a quaternary ammonium compound and the biocidally effective  
3        amount is about .05 to about 1 weight percent of the  
4        composition.

1        7. The composition of claim 6, wherein the acaricide  
2        is a pyrethroid and the acaricidally effective amount is  
3        about .05 to about 3 weight percent of the composition.

1        8. The composition of claim 7, further comprising  
2        about 81 to about 94.9 weight percent isoparaffinic  
3        solvent; and  
4              wherein the fluoropolymer comprises about 5 to about  
5        15 weight percent of the composition.

1           9. The composition of claim 1, further comprising  
2   about 66 to about 96.4 weight percent water, about .5 to  
3   about 5 weight percent surfactant, and about 1 to about 10  
4   weight percent glycol ether.

1           10. The composition of claim 9, wherein the biocide  
2   is a quaternary ammonium compound and the biocidally  
3   effective amount is about .05 to about 1 weight percent of  
4   the composition.

1           11. The composition of claim 10, wherein the  
2   acaricide is a pyrethroid and the acaricidally effective  
3   amount is about .05 to about 3 weight percent of the  
4   composition.

1           12. A composition for treating a substrate to control  
2   dust mites, said composition comprising about .1 to about  
3   20 weight percent of a fluoropolymer, about .001 to about 5  
4   weight percent of a quaternary ammonium compound, and about  
5   .01 to about 10 weight percent of a pyrethroid.

1           13. The composition of claim 12, wherein the  
2   fluoropolymer is a perfluorinated polymer.

1           14. The composition of claim 13, wherein the  
2   quaternary ammonium compound is didecyldimethylammonium  
3   chloride.

1           15. The composition of claim 14, wherein the  
2   pyrethroid is permethrin.

1           16. A method of treating a substrate to control dust  
2   mites, said method comprising the step of applying a  
3   composition to the substrate, wherein the composition  
4   comprises a fluoropolymer and an acaricidally effective  
5   amount of an acaricide.

1           17. The method of claim 16, wherein the composition  
2   is in liquid form.

1           18. The method of claim 16, wherein the composition is  
2   in powder form.

1           19. The method of claim 16, wherein the composition  
2   further comprises a biocidally effective amount of a  
3   biocide.

1           20. The method of claim 19, wherein the acaricide is  
2   permethrin.

1           21. The method of claim 20, wherein the biocide is  
2   didecyldimethylammonium chloride.

1           22. The method of claim 16, wherein the composition  
2   further comprises an isoparaffinic solvent.

1           23. The method of claim 16, wherein the composition  
2   further comprises water.

1           24. The method of claim 22, wherein the acaricidally  
2   effective amount of acaricide is about .05 to about 3  
3   weight percent of the composition, the biocidally effective  
4   amount of biocide is about .05 to about 1 weight percent of  
5   the composition, the fluoropolymer comprises about 5 to  
6   about 15 weight percent of the composition, and the  
7   isoparaffinic solvent comprises about 81 to about 94.9  
8   weight percent of the composition.

1           25. The method of claim 23, wherein the acaricidally  
2   effective amount of acaricide is about .05 to about 3  
3   weight percent of the composition, the biocidally effective  
4   amount of biocide is about .05 to about 1 weight percent of  
5   the composition, the fluoropolymer comprises about 2 to  
6   about 15 weight percent of the composition, and water

7      comprises about 66 to about 96.4 weight percent of the  
8      composition.

1            26. A method of treating a substrate to control dust  
2      mites, said method comprising the step of applying a  
3      composition to the substrate, wherein the composition  
4      comprises a biocidally effective amount of a biocide, and  
5      an acaricidally effective amount of an acaricide.

1            27. The method of claim 26, wherein the composition  
2      further comprises a fluoropolymer.

1            28. The method of claim 27, wherein the biocide is a  
2      quaternary ammonium compound and the biocidally effective  
3      amount is about .05 to about 1 weight percent of the  
4      composition; and

5            wherein the acaricide is permethrin and the  
6      acaricidally effective amount is about .05 to about 3  
7      weight percent of the composition.

## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/IB 99/01405

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 A01N25/24 A01N53/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 A01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 97 24484 A (SOGILO) 10 July 1997 (1997-07-10) page 3, line 16 -page 5, line 17  claims 1-8	1,2,4,5, 9,16-28
Y	US 5 916 917 A (JANETTE SUH ET AL.) 29 June 1999 (1999-06-29) column 4, line 65 -column 9, line 40  example 1	3,6-8, 10-15
X		26
Y		—

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

## \* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the International filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the International filing date but later than the priority date claimed

- "T" later document published after the International filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "8" document member of the same patent family

Date of the actual completion of the International search

Date of mailing of the International search report

19 November 1999

30/11/1999

Name and mailing address of the ISA  
European Patent Office, P.B. 5018 Patentzaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Fort, M

## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/IB 99/01405

C(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>DATABASE WPI  Derwent Publications Ltd., London, GB;  AN 1997-209183  XP002123254</p> <p>KAO CORPORATION: "Household insecticidal compsn.-contains quaternary ammonium salt, and insecticide e.g. pyrethroid"  abstract  &amp; JP 09 059109 A</p> <p>—</p>	26
X	<p>DATABASE WPI  Derwent Publications Ltd., London, GB;  AN 1986-116639  XP002123255</p> <p>SANYO MOKUZAI BOFU KK: "Insecticidal and ant controlling compsn. contg. phosphate and/or pyrethroid insecticide and amine cpd. and/or quat. ammonium cpd."  abstract  &amp; JP 61 057506 A</p> <p>—</p>	26
A	<p>DE 42 31 010 A (VERLIEBTER ET AL.)  17 March 1994 (1994-03-17)</p> <p>—</p>	

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International Application No

PCT/IB 99/01405

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
WO 9724484 A	10-07-1997	BE	1009900 A	07-10-1997
		AU	1361897 A	28-07-1997
		CZ	9702697 A	18-02-1998
		DE	29622338 U	13-03-1997
		EP	0812372 A	17-12-1997
		ES	2113328 A	16-04-1998
		FR	2742977 A	04-07-1997
		JP	11501246 T	02-02-1999
		NL	1004907 C	19-01-1999
		NL	1004907 A	02-07-1997
		NO	973939 A	27-08-1997
		NZ	325161 A	23-12-1998
US 5916917 A	29-06-1999	NONE		

**THIS PAGE BLANK (USPTO)**